EXHIBIT 3

UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

TQ DELTA, LLC, *Plaintiff*, v. **COMMSCOPE HOLDING COMPANY, INC., COMMSCOPE INC., ARRIS US HOLDINGS, INC., ARRIS SOLUTIONS, INC., ARRIS TECHNOLOGY, INC., and ARRIS ENTERPRISES, LLC** *Defendants*.	CIV. A. NO. 2:21-CV-310-JRG (Lead Case)

TQ DELTA, LLC, *Plaintiff*, v. **NOKIA CORP., NOKIA SOLUTIONS AND NETWORKS OY, and NOKIA OF AMERICA CORP.,** *Defendants*.	CIV. A. NO. 2:21-CV-309-JRG (Member Case)

OPENING EXPERT REPORT OF BRUCE MCNAIR ON THE INVALIDITY OF THE ASSERTED CLAIMS OF THE FAMILY 6 PATENTS (U.S. PATENT NOS. 8,462,835; 8,594,162)

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portion, and not the interleaver, that "uses" a first interleaver parameter value and a second interleaver parameter value.

D. Claim Construction

278. I have reviewed the Court's Claim Construction Order for the '835 and '162 patents, dated June 8, 2022 (hereinafter, "Claim Construction Order").

279. A summary of the terms for Family 6 for which the Court provided a construction is provided below:

Patent(s)	Term or Phrase	Court's Construction
'835	"steady-state communication"	"the state of the transceiver reached after all initialization and training is completed in which user data is transmitted or received"
'835	"FIP setting"	"set including at least one forward error correction parameter value and at least one interleaver parameter value"
'835	"FIP value"	"numerical value of a forward error correction parameter or numerical value of an interleaver parameter"
'835, '162	"flag signal"	"signal used to indicate when an updated FIP setting is to be used (the signal does not include the FEC codeword counter value upon which the updated FIP setting is to be used)"
'835, '162	"interleaver parameter value"	"numerical value of the interleaver depth"

280. In my analysis, I have applied the Court's constructions. I have interpreted the remaining claim terms as they would have been understood by a person having ordinary skill in the art on the priority date of the '835 and '162 patents, considering the context of the claims themselves, the written description, the figures, the prior art, and the prosecution history. Consistent with these constructions and interpretations, I have considered the claims in light of the ordinary meaning of the claims based on the perspective of one of skill in the art and consistent with my experience in the field.

369. Accordingly, G.992.1 discloses transceivers that are configurable to transmit a signal using a first FIP setting.

d. <u>"transmit a flag signal"</u>

370. As construed by the Court, a flag signal is a "signal used to indicate when an updated FIP setting is to be used (the signal does not include the FEC codeword counter value upon which the updated FIP setting is to be used)." Claim Construction Order, 91.

371. G.992.1 discloses that the ATU-C transmits a signal to indicate when an updated FIP setting is to be used, and this signal does not include any FEC codeword counter value upon which the updated FIP setting is to be used.

372. Specifically, the ATU-C sends the DRA_Swap_Request message "to inform the ATU-R about when to swap the rate." G.992.1, § II.6. A superframe reference number (SFR) included in the DRA_Swap_Request message identifies "around which superframe boundary the rate swap will occur." *Id.* G.992.1 explains that when the ATU-C and ATU-R operate with the mandatory S-values, the SFR references "always coincide with codeword boundaries," which "avoids an explicit Reset of the FEC-mechanism." *Id.*

373. As a person having ordinary skill as of the '835 patent's priority date would have recognized, the superframe reference number is not a FEC codeword counter value, and no other item of information in the DRA_Swap_Request message is a FEC codeword counter value. Indeed, G.992.1 does not define or use a FEC codeword counter.

374. The '835 patent describes the FEC codeword counter in detail and explains that the transmitter sets its FEC codeword counter to zero at the beginning of Showtime and thereafter increments its FEC codeword counter as it transmits each FEC codeword. '835 patent, 11:10-16, 11:20-25. Similarly, the receiver sets its FEC codeword counter to zero at the beginning of Showtime and thereafter increments its FEC codeword counter as it receives each

FEC codeword. *Id.* at 11:30-35. Thus, the '835 patent specifically describes the operation of the FEC codeword counters that are excluded from the flag signal embodiment: each FEC codeword counter counts each FEC codeword as it is transmitted or received. Both the transmitter's and receiver's counters may have a finite number of bits and may roll over (reset to zero) after reaching a maximum value. *Id.* at 11:25-29, 11:35-38.

375. The FEC codeword counters described in the '835 patent appear to be a feature only of the '835 patent. "FEC codeword counter" was not a term of art as of the '835 patent's priority date, and no such FEC codeword counters, or any counters even resembling the FEC codeword counters described by the '835 patent, are defined in any of the ADSL standards in existence as of the '835 patent's priority date. *See, e.g.*, G.992.3, § 5.1 (referring to "performance monitoring counters"); *id.* at § 7.6 (defining "mux data frame selector counter"); *id.* at § 7.7.1.1 (mux data frame selector counter "is initialized to zero at the completion of initialization" and "is incremented each time a complete Mux Data Frame is constructed"); *id.* at § 7.8.2.1 (defining "overhead structure frame counter" that "is maintained in each latency path with the frame counter incremented by one for each sync octet transmitted"); *id.* at § 8.15.4 (referring to "symbol counter that was initialized at the start of the R-MEDLEY state"); *id.* at § 9.4.1.3 (referring to "performance monitoring counters as described in ITU-T Rec. G.997.1"); *id.* ("Upon receipt of the read time command, the receiving ATU shall transmit the response message that includes the current value of the time counter"); *id.* at § 9.4.1.6 (defining and specifying requirements for "management counters maintained by the far ATU in accordance with ITU-T Rec. G.997.1"); *id.* at § K.2.9.3.3 (specifying that "[t]he TPS-TC management counters in the response to the overhead management counter read command corresponding to the ATM-TC function shall be provided as defined in ITU-T Rec. G.997.1"); G.992.2, § 9.1.2

("The ATU transmitters and receivers shall start superframe counters immediately upon entering SHOWTIME from either initialization or fast retrain."); *id.* at § 10.3.3 (referring to "near-end and far-end failure counters for each near-end and far-end failure defined in Recommendation G.997.1"); *id.* at § C.2.1.16 (referring to "Sliding window frame counter"); T1.413 Issue 1, § 12.2.3 ("A counter, which is reset upon entering C-QUIET1, should keep track of how many times ATU·C goes from C·QUIET2 and back to C-ACT."); *id.* at § 13.2.2 (defining superframe counter); *id.* at Table A.1 (referring to "Initialize Train_Try_Counter"); T1.413 Issue 2, § 8.2.4.3 (referring to "near-end and far-end failure counters"); *id.* at § 8.2.4.10 (referring to "performance counters at the far-end," which "may be accessed as described in the ATM Forum ILMI or through the clear channel eoc protocol as described in ANNEX L"); *id.* at § 9.2.3 ("A counter, which is reset upon entering C-QUIET1, should keep track of how many times ATU-C goes from C-QUIET2 and back to C-ACT"); *id.* at § 10.2.2 (defining superframe counter); *id.* at Table A.1 (referring to "Initialize Train_Try_Counter"). Thus, as a person having ordinary skill in the art would have recognized, the FEC codeword counters referred to in the '835 patent and excluded from the Court's construction are defined exclusively in the '835 patent.

376. G.992.1 specifies three counters, but none of them is a FEC codeword counter. For example, G.992.1 specifies superframe counters. *See, e.g.*, G.992.1, § 11.2.2 (describing ATU-C and ATU-R superframe counters); *id.* at § 11.2.5 (referring to superframe counters); *id.* at § 11.2.6 (same); *id.* at § 11.2.7 (same); *id.* at § C.8.1.3 (same); *id.* at § II.6 (same). G.992.1 also specifies a "sliding window frame counter" used in Annex C (for Japan). *See, e.g.*, *id.* at § C.2 (referring to "Sliding Window frame counter"); *id.* at § C.7.4.1 (same). And G.992.1 specifies a "Train_Try_Counter" used during the initialization procedure. *See, e.g.*, *id.* at Table

D.1 (referring to "Train_Try_Counter"). Nowhere does G.992.1 describe or imply the existence of any FEC codeword counter as defined in the '835 patent, nor does it provide any reason why a transmitter or receiver would want or need to count FEC codewords.

377. Moreover, the value of the superframe counter is not a proxy for a FEC codeword counter at least because (a) the superframe counter does not count each FEC codeword as it is transmitted or received as the FEC codeword counters defined in the '835 patent do, and (b) it is not possible to determine based solely on the superframe counter how many FEC codewords have been transmitted or received or what the value of a hypothetical FEC codeword counter would be. As I explained above, in G.992.1, the number of DMT symbols per superframe is 69, where the first 68 of the DMT symbols in a superframe are data symbols, and the last symbol is the synchronization symbol. G.992.1 defines a superframe counter. *See* G.992.1, § 11.2.2 (defining superframe counting and "superframe counter"). The value of the superframe counter is set to 0 when Showtime begins and is incremented after the transmission (for the transmitter) or reception (for the receiver) of each superframe. *See, e.g.*, *id.* ("The ATU-C and ATU-R transmitters shall start their counters immediately after transmitting C-SEGUE3 and R-SEGUE5 (see 10.8.16 and 10.9.17), respectively; this marks the transition between initialization and steady state operation. Superframe counting starts with the first superframe at beginning of Showtime being superframe 0. Each transmitter shall increment its counter after sending each ADSL superframe (see 7.4.1.1). Correspondingly, each receiver shall start its counter immediately after receiving C-SEGUE3 or R-SEGUE5, respectively, and then increment it after receiving each superframe. Superframe counting is performed MOD 256. Synchronization of the corresponding transmitter and receiver superframe counters is maintained using the synchronization symbol in the ADSL frame

structure. Any form of restart that requires a transition from initialization to steady state shall reset the superframe counter.”).

378. The value of S is the number of DMT symbols per FEC codeword. G.992.1, § 7.4.1.2.2 (“S = number of DMT symbols per FEC codeword”). In other words, each FEC codeword spans S DMT symbols. The mandatory values of S are provided in Tables 7-7 (downstream) and 8-3 (upstream), copied below.

Table 7-7/G.992.1 – Minimum FEC coding capabilities for ATU-C

Parameter	Fast buffer	Interleaved buffer
Parity bytes per R-S codeword	R_F = 0, 2, 4, 6, 8, 10, 12, 14, 16 (Note 1)	R_I = 0, 2, 4, 6, 8, 10, 12, 14, 16 (Notes 1 and 2)
DMT symbols per R-S codeword	S = 1	S = 1, 2, 4, 8, 16
Interleave depth	Not applicable	D = 1, 2, 4, 8, 16, 32, 64
NOTE 1 – R_F can be > 0 only if K_F > 0, and R_I can be > 0 only if K_I > 0. NOTE 2 – R_I shall be an integer multiple of S.		

The ATU-C shall also support upstream transmission with at least any combination of the FEC coding capabilities shown in Table 8-3.

Table 8-3/G.992.1 – Minimum FEC coding capabilities for ATU-R

Parameter	Fast buffer	Interleaved buffer
Parity bytes per RS codeword	R_F = 0, 2, 4, 6, 8, 10, 12, 14, 16 (Note 1)	R_I = 0, 2, 4, 6, 8, 10, 12, 14, 16 (Notes 1 and 2)
DMT symbols per RS codeword	S = 1	S = 1, 2, 4, 8, 16
Interleave depth	not applicable	D = 1, 2, 4, 8
NOTE 1 – R_F can be > 0 only if K_F > 0 and R_I can be > 0 only if K_I > 0. NOTE 2 – R_I shall be an integer multiple of S.		

The ATU-R shall also support downstream transmission with at least any combination of the FEC coding capabilities shown in Table 7-7.

As indicated by the tables above, the number of DMT symbols per FEC codeword is always 1 for the fast path, and for the interleaved path, the value of S can be 1, 2, 4, 8, or 16 in both the upstream and downstream directions.

379. A simple example illustrates why the superframe counter is neither a FEC codeword counter nor a proxy for one. When the value of S is 1, there are 68 FEC codewords per superframe because there are 68 data frames per superframe, each mapped to a different DMT symbol, and S = 1 means that each FEC codeword spans exactly one data frame. Assume for simplicity that the transceivers have just transitioned to Showtime, so the superframe counter value is 0. In this case, if there were a FEC codeword counter in G.992.1—which there is not—its value would be set to zero at the beginning of Showtime and would increase by 1 after every FEC codeword (and, therefore, data frame and DMT symbol) transmitted or received during the superframe, as described in the '835 patent. *See, e.g.*, '835 patent, 11:10-38. By the end of the 68th data frame of the superframe, which is one frame before the end of the superframe, the value of this hypothetical codeword counter would have increased by a total of 68. In contrast, the value of the superframe counter would still be 0 after transmission or reception of the 68th data frame of the superframe.

380. Figure 8 below illustrates for S = 1 that the FEC codeword counter described in the '835 patent, which does not exist in G.992.1, would always increment at a faster pace than the superframe counter of G.992.1. Moreover, the superframe counter of G.992.1 only increments after the transmission of the synchronization symbol, which carries no data and therefore does not carry a FEC codeword. The hypothetical FEC codeword counter would not be incremented after the synchronization symbol. Thus, the superframe counter of G.992.1 and the hypothetical FEC codeword counter defined in the '835 patent would never increment at the same time.

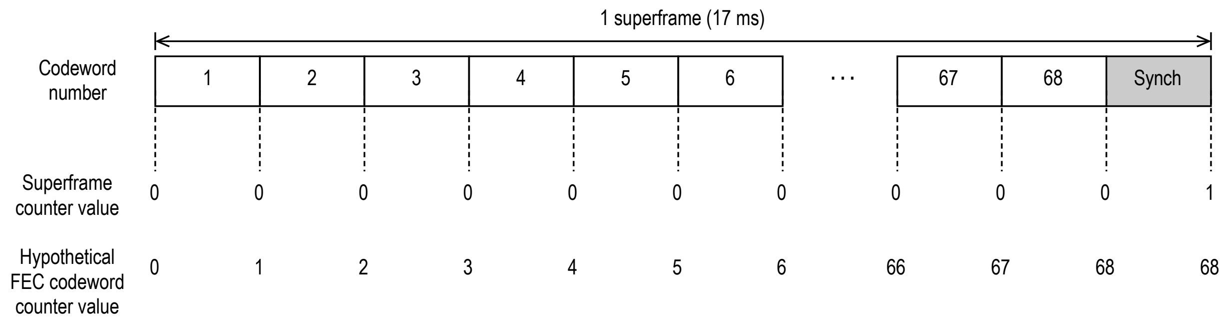

Figure 8: Comparison of how G.992.1 superframe counter increments and how a FEC codeword counter as described in the '835 patent would increment when S = 1

381. Moreover, given a superframe counter value and an S value, it is impossible to determine how many FEC codewords have been transmitted or received. For example, when S = 1 and the superframe counter value is equal to 1, all that can be said is somewhere between 68 and 135 FEC codewords have been transmitted or received since the last time the superframe counter was reset to zero (either at the beginning of Showtime or after rolling over).

382. When the value of S is larger than 1, there are fewer than 68 FEC codewords per superframe, because each FEC codeword spans more than one frame, but the analysis is similar to that provided above for the case when S = 1. Specifically, when the value of S is 2, each FEC codeword is carried by two frames, so there are 68/2 = 34 FEC codewords per superframe because there are 68 data frames per superframe. Thus, there is an integer number of FEC codewords in each superframe, but a hypothetical FEC codeword counter operating as described in the '835 patent would increment after every set of two data frames (one FEC codeword), and it would never increment at the same time as the superframe counter, which only increments after transmission/reception of the synchronization symbol. When the value of S is 4, each FEC codeword spans four data frames, so there are 68/4 = 17 FEC codewords per superframe because there are 68 data frames per superframe. Again, there is an integer number of FEC codewords in each superframe, but a hypothetical FEC codeword counter operating as

described in the ’835 patent would increment after every set of four data frames (one FEC codeword), and it would never increment at the same time as the superframe counter, which only increments after the synchronization symbol is transmitted or received.

383. For S values of 8 and 16, there is not an integer number of FEC codewords per superframe. For example, when the value of S is 16, each superframe contains some integer number of codewords plus a fractional portion of at least one other codeword. As Figure 9 below illustrates, the beginning of a superframe only aligns with a FEC codeword boundary after every four superframes, which is the reason Appendix II of G.992.1 specifies that “Valid values of SFR are: SFR = $4 \times N - 1$ where N is an integer number.” G.992.1, § II.6. This restriction guarantees that for any one of the mandatory S values, the selected SFR value will always coincide with a FEC codeword boundary, thus allowing the transition to be seamless with respect to the FEC encoder and decoder. *See id.* (“If the modems operate with the mandatory S-values, these SFR-references always coincide with codeword boundaries. This avoids an explicit Reset of the FEC-mechanism.”). Note that the hypothetical FEC codeword counter operating as described in the ’835 patent would increment after every set of sixteen data frames, but, once again, it would never increment at the same time as the superframe counter, which increments only after transmission (at the transmitter) or reception (at the receiver) of the synchronization symbol.

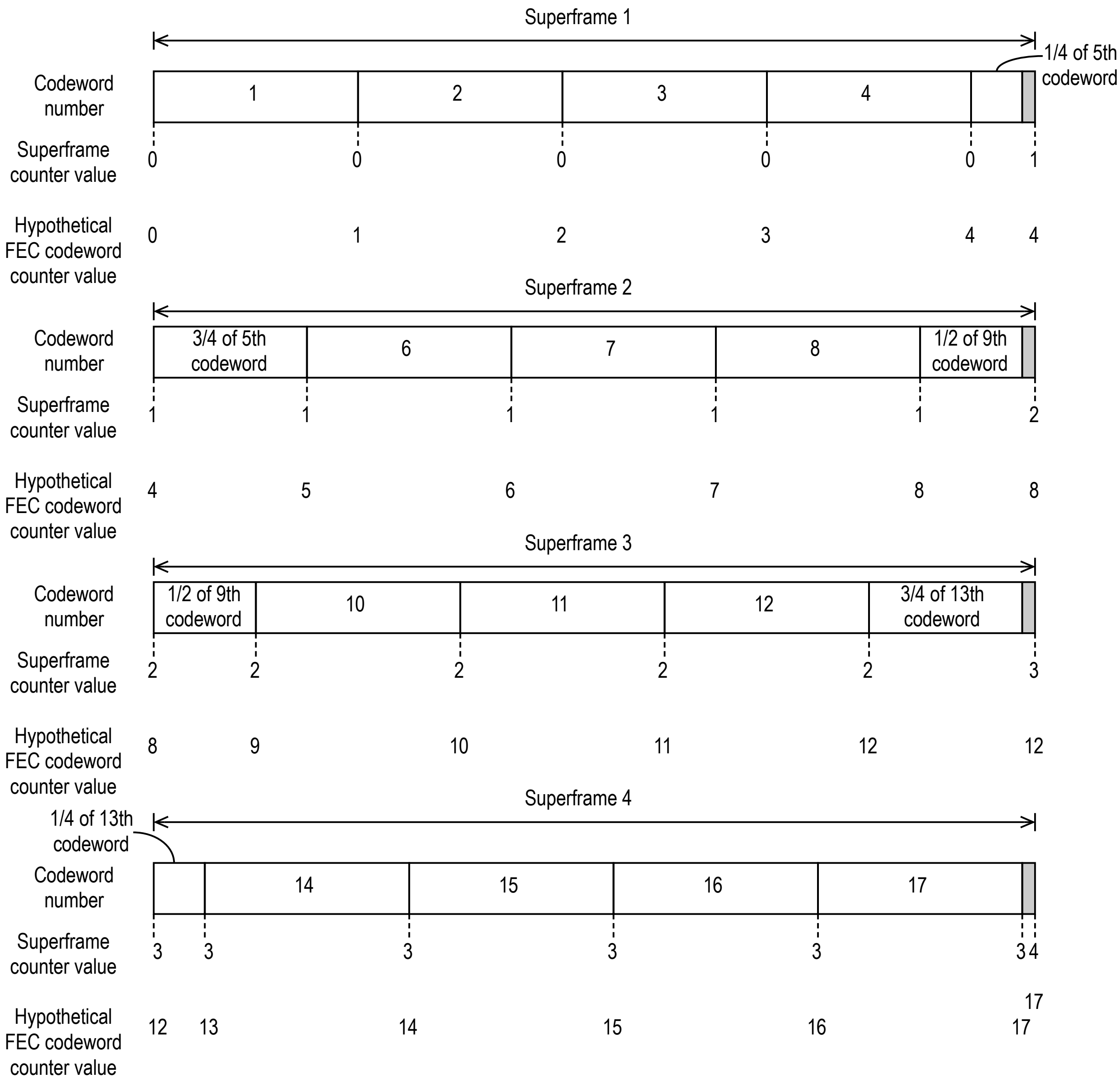

Figure 9: Comparison of how G.992.1 superframe counter increments and how a FEC codeword counter as described in the '835 patent would increment when S = 16

384. There is no mandatory value of S that results in there being one FEC codeword per superframe, which is the only way the superframe counter would provide a count of FEC codewords. When any of the mandatory values of S is used, the superframe counter always increments more slowly than any hypothetical FEC codeword counter would. Because the superframe counter only increments after a complete superframe has been transmitted or received, and each superframe always contains multiple FEC codewords (and potentially

fractions of FEC codewords), and the number of codewords per superframe is dependent on the value of S, the value of the hypothetical FEC codeword counter defined in the ’835 patent cannot be determined from the value of the superframe counter.

385. Furthermore, the superframe counter and the FEC codeword counter described in the ’835 patent roll over to zero at different times. The superframe counter is 8 bits, meaning it counts from 0 to 255 and then rolls over to 0. *See, e.g.*, G.992.1, § 11.2.5. In contrast, the FEC codeword counter described in the ’835 patent is a 10-bit counter that counts from 0 to 1023 and then rolls over to 0. ’835 patent, 11:25-29, 11:35-38. In the case that S = 1, the FEC codeword counter of the ’835 patent would roll over to zero for the first time during the 15th superframe transmitted/received. At this time, the value of the superframe counter would be 14. The FEC codeword counter of the ’835 patent would roll over many more times before the superframe counter rolled over for the first time. Even in the case that S = 16, the FEC codeword counter of the ’835 patent would still roll over before the superframe counter rolled over. Specifically, the FEC codeword counter would roll over during the 240th superframe, whereas the superframe counter of G.992.1 would roll over only after transmitting the 256th superframe. Thus, there is no tractable relationship between the value of the superframe counter and the hypothetical FEC codeword counter defined in the ’835 patent that would allow the value of the hypothetical FEC codeword counter to be determined accurately based on the superframe counter value.

386. Thus, for all of the reasons discussed above, the SFR value is neither a FEC codeword counter value nor a proxy for one.

387. Accordingly, G.992.1 discloses that the ATU-C transmits a flag signal.

388. G.992.1 also discloses that the ATU-R transmits a flag signal. The DRA_Swap_Reply message indicates whether the ATU-R accepts the ATU-C's proposed timing of the reconfiguration. G.992.1, § 11.6.3. When the ATU-R accepts the proposed timing, it sends the value 01_{16} in the status field of the DRA_Swap_Reply message and echoes the SFR value sent by the ATU-C in the data field. *Id.* Accordingly, whenever the DRA_Swap_Reply message accepts the ATU-C's proposed timing for the reconfiguration, the DRA_Swap_Reply message is a signal used to indicate when an updated FIP setting is to be used. This signal does not include the FEC codeword counter value upon which the updated FIP setting is to be used for the reasons provided above in the explanation of why the DRA_Swap_Request message is a flag signal: the SFR value is not a FEC codeword counter value.

389. To the extent the Court or fact-finder determines that neither the DRA_Swap_Request message nor the DRA_Swap_Reply message of G.992.1 meets the "transmit a flag signal" element, it would have been obvious for the ATU-R to "transmit a flag signal," namely an inverted sync symbol, in response to the DRA_Swap_Request message for several reasons.

390. First, as I have explained, well before the '835 patent's earliest priority date, dynamic rate repartitioning had been proposed for the emerging ADSL2 standard. *See, e.g.*, BA-055R1. One of the objectives of dynamic rate repartitioning was to "be able to dynamically repartition the data bandwidth between the various ADSL data channels." *Id.* at p. 3. It was known that the DRA protocol of G.992.1 would be too slow for telephony applications. *See, e.g.*, BA-055R1, pp. 3-4 ("Dynamic Rate Adaptation (DRA, G.992.1 appendix II) provides a mechanism for dynamically altering the data bandwidth partitioning between ADSL data channels. However, this mechanism is not adequate for telephony applications because it is too

slow and it does not guarantee error free PCM data. . . . The G.992.1 Appendix II definition (Section II.6) requires that the SFR value sent by the ATU-C must be at least 47 superframes (800 msec) greater than the present superframe counter value (t=0). This delay is to guarantee sufficient time for reception and reconfiguration calculations to be ready for the DRA transition. However, for DRR events, the reconfiguration is significantly lower in complexity since no bits and gains tables are modified. Furthermore, the delay associated with 47 superframes makes any dynamic bandwidth allocation for PCM voice violate telephony call setup/tear down timing requirements."). Therefore, a person having ordinary skill in the art would have considered whether the DRA protocol of G.992.1 could be made faster for applications such as DRR for telephone call setup and tear-down.

391. As I explained previously, during the work on idle mode (later to be known as Qmode or quiescent mode), the use of an inverted synchronization symbol with the G.992.1 DRA protocol was proposed to allow fast exits from idle mode. *See, e.g.*, CI-051, p. 3 ("In an effort to minimize the required changes, 3Com suggests that two new commands be added to the Dynamic Rate Adaptation command set: DRA_Idle_Request: Generated at either the ATU-C or ATU-R, this command would signal a request to enter idle mode at a particular superframe boundary, as specified by the superframe counter. DRA_Idle_Reply: Generated at the receiver, this command would be a response to the DRA_Idle_Request. . . . For exiting idle mode, 3Com proposes that the final idle mode symbol be shifted 180° with respect to the other idle mode symbols (with the exception of the pilot carrier which may be required for timing recovery). This can be initiated by either the ATU-C or ATU-R. Upon detection, the receiver assumes the next symbol is the first symbol of the first superframe following the idle period interruption. The latency of this proposal is one DMT symbol and thus has no effect on the data latency and

imposes no additional buffering requirements."); *id.* at p. 2 ("3Com proposes that the superframe synchronization symbol be used as the idle symbol.").

392. Accordingly, the use of an inverted sync symbol, which the '835 patent states is a flag signal, ('835 patent, 12:29-31), had already been proposed in 1998 as a modification to improve the speed at which changes to transceiver configurations could be made. Thus, modifying the DRA protocol of G.992.1 to use an inverted sync symbol instead of the DRA_Swap_Reply message to improve the speed of dynamic rate reconfigurations for voice applications would have been obvious. G.992.1 disclosed that the superframe boundaries coincide with the FEC codeword boundaries at least every $4 \times N - 1$ superframes, where N is an integer number. Thus, it would have been obvious for the ATU-R to transmit an inverted sync symbol instead of the DRA_Swap_Reply message to acknowledge the DRA_Swap_Request message from the ATU-C. This inverted sync symbol would confirm to the ATU-C that the switch to a new FIP setting will occur at the superframe boundary specified by the SFR value sent by the ATU-C in the DRA_Swap_Request message.

393. Thus, G.992.1 discloses and/or renders obvious a transceiver that is configurable to transmit a flag signal.

e. <u>"switch to using for transmission, a second FIP setting following transmission of the flag signal"</u>

394. G.992.1 discloses that both the ATU-C and ATU-R switch to using for transmission a second FIP setting following transmission of the flag signal.

395. G.992.1 discloses that the DRA procedure defined in Appendix II "allows reconfiguration of the modem during Showtime" without "a lengthy restart to reconfigure the modem." G.992.1, § II.1. The described DRA "is a mechanism that during ShowTime, without the need to restart: Allows rate modifications (up and downgrades) for both US and DS." *Id.* at

Executed in Holmdel,.NJ

Date: August 29, 2022

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